USER'S MANUAL

CLAMP ON MULTIMETER

DCL-420

CIRCUIT-TEST ELECTRONICS
www.circuittest.com

TABLE OF CONTENTS

SAFETY INFORMATION 2

SAFETY SYMBOLS 3

INTRODUCTION 4

LCD SYMBOL DEFINITIONS 4

FRONT PANEL DESCRIPTION 5

SPECIFICATIONS

General 6

Ranges and Accuracy 7

OPERATING INSTRUCTIONS

1. DC Voltage Measurement 8
2. AC Voltage Measurement 8
3. DC Current Measurement 9
4. AC Current Measurement 9-10
5. Resistance Measurement 10
6. Continuity Test 10
7. Frequency Measurement 11
8. Temperature Measurement 11
9. Min/Max Measurement 11-12
10. Data Hold Function 12
11. Battery Replacement 13

MAINTENANCE 13

ACCESSORIES 14

WARRANTY 14

SAFETY INFORMATION

This meter is CUL and UL approved and conforms to IEC 61010-1 for Category II - 600V. This meter is designed to be safe under the following conditions: indoor use, altitude up to 2000m, temperature 5°C to 40°C, maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C and rated pollution degree 2. Caution and proper guidelines must be followed for personal and product safety. Read this instruction manual carefully and completely before using the meter. Lack of caution or poor safety practices can result in serious injury or death.

- This meter is not recommended for high voltage industrial use; for example, do not use for measurement on 440VAC or 600VAC industrial power mains. The unit is intended for use with low energy circuits up to 600VDC / 600VAC or high energy circuits up to 250VAC / 250VDC only.
- Use caution when working above 60VDC or 30VAC RMS as these voltages pose a shock hazard.
- Always consider circuits to be energized. Never assume any equipment to be de-energized.
- Always start with power off. Set the function switch to the correct setting before making any measurements and do not change position of the function switch during measurements.
- Never connect unit to AC or DC powered circuits when the function switch is set to resistance, diode check or continuity ranges.
- Always disconnect the power when performing resistance, diode or capacitance tests. Discharge capacitor before testing.
- Disconnect the live/positive test lead (red) prior to disconnecting the common/negative test lead (black).
- When **BATT** appears on the display, change the battery immediately.
- Disconnect test leads from the meter before removing the battery.
- Do not operate the unit unless the case is completely closed.
- When using the test probes always keep fingers behind the finger guards. Never touch the exposed probe tip.
- Always inspect the instrument, test leads and other accessories for damage prior to use.
- Use only UL recognized test leads (included with this meter).

SAFETY SYMBOLS

Safety symbols and special annunciators on the meter and in this manual indicate cautions and warnings of important operational procedures that must be followed to ensure personal and product safety.

This symbol indicates a General Warning. When adjacent to a terminal or operating device indicates that the operator must refer to an explanation in the Operating Instructions.

This symbol indicates that the terminal(s) so marked must not be connected to a circuit point at which the voltage with respect to ground exceeds 500V AC/DC.

This symbol adjacent to one or more terminals indicates them as being associated with ranges that may in normal use, be subjected to particularly hazardous voltages. For maximum safety, the meter and its test leads should not be handled when these terminals are energized.

This meter is protected by double insulation. Service this meter by a professional only.

INTRODUCTION

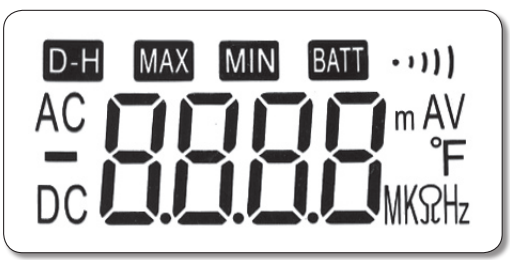
DCL-420 is a True RMS Auto Ranging Clamp on meter with 3-3/4 digit 4000 count display. This meter can measure/test the following:

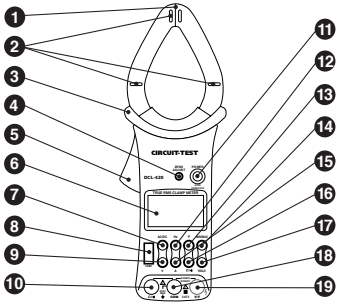
- Voltage
- Resistance
- Temperature
- Current
- Continuity
- Frequency

LCD DISPLAY SYMBOL DEFINITIONS

DISPLAY/SYMBOL	DEFINITION
AC	Alternating Current
DC	Direct Current
D-H	Data Hold
MAX	Maximum Value
MIN	Minimum Value
BATT	Low Battery
·))	Continuity
m	milli

DISPLAY/SYMBOL	DEFINITION
A	Amperage
V	Voltage
°F	Degrees Fahrenheit
M	Mega
K	Kilo
Ω	Ohms
Hz	Hertz (Frequency)





FRONT PANEL DESCRIPTION

NO.	ITEM	DESCRIPTION
1	Clamp Jaws	Measure AC and DC current by clamping it around a single current carrying wire.
2	Centering Marks	Position the conductor within the clamp jaws at the intersection of these marks in order to meet the specified accuracy.
3	Hand Guard	Provides a protective distance from the jaw
4	DC Amps Zero Adjust	Use to adjust the displayed reading to 0000 in DC Amps mode, prior to making the measurements
5	Jaw Trigger	Press to open the clamp jaw
6	LCD Display	3-3/4 digit 4000 count LCD Display
7	AC/DC Button	Select AC or DC mode for current and voltage measurements
8	Temperature Jack	Plug in 'K' type thermocouple
9	Voltage Button	Press to select voltage measurement
10	[Ω/•))] Jack	Positive input jack to plug in red test lead to measure resistance or to check continuity
11	Power Button	Power ON/OFF pushbutton switch
12	Frequency Button	Press to select frequency measurement
13	Temperature °F Button	Select temperature measurement function in degrees Fahrenheit
14	MIN/MAX Button	Select MIN or MAX measurement function. This feature will not work for (°F) temperature function
15	Current Button	Press to select current measurement
16	[Ω/•))] Button	Press to select between resistance measurement or continuity test
17	Data Hold Button	Displayed data will freeze and 'D-H' will appear on the LCD. Changes in the input signal will not change the display
18	COM Jack	Plug in black test lead in all measurement modes, common ground
19	V/F Jack	Positive input jack to plug in red test lead to measure voltage or frequency

SPECIFICATIONS

GENERAL

Display:	3 3/4 digit 4000 count LCD
Maximum Display:	3999
Ranging:	Auto
Auto Shut-off:	Meter will shut-off after 15 minutes from last use
Polarity:	Automatic, minus (-) sign indicates negative polarity, no sign for positive polarity
Input impedance:	10MΩ (DCV / ACV)
Continuity:	Audible signal sounds if resistance is less than 36Ω (Note: The display will read up to 400.0Ω in continuity mode)
Over range indication:	a) In Continuity Check: 400.0Ω & ·)) appears on the display with '4' flashing b) In Resistance Mode: 40.00MΩ appears on the display with '4' flashing
Operating Temp:	0 to 50° C (32 to 122° F)
Relative Humidity:	<80% Operating/Storage
Power Source:	1 x 9V Battery
Overload Protection:	This meter is protected in the Resistance Range by PTC (Positive Temperature Coefficient) up to 600V
Temperature Probe:	'K' Type Thermocouple rated at 0° to 500°F (Model no. TL-190)
Dimensions:	90(H) x 232(W) x 45(D) mm ($3^1/_2$ x $9^1/_8$ x $1^3/_4$")
Weight:	390g (13.75 oz)
Accessories included:	One pair of test leads, 1 x 9V battery, 'K' type thermocouple, Screw-on Alligator clips, Carrying Case, User's manual

RANGES AND ACCURACY

FUNCTION	RANGE	RESOLUTION	ACCURACY
DC VOLTAGE (DC V)	400mV 4V 40V 400V 600V	0.1mV 0.001V 0.01V 0.1V 1V	±(1.0% reading + 4 digits)
AC VOLTAGE (AC V)	4V 40V 400V 600V	0.001V 0.01V 0.1V 1V	±(1.5% reading + 4 digits) @ 50Hz, 60Hz and 400Hz ±(3.5% reading + 4 digits) @ 40Hz to 1KHz
DC CURRENT (DC A)	400A 600A	0.1A 1A	±(1.5% reading + 4 digits)
AC CURRENT (AC A) (40-400HZ)	300A 600A	0.1A 1A	±(1.5% reading + 4 digits) @ 50Hz, 60Hz and 400Hz ±(3.5% reading + 4 digits) @ 40Hz to 1KHz
RESISTANCE	400 Ω 4k Ω 40k Ω 400k Ω	0.1 Ω 1 Ω 10 Ω 100 Ω	±(1.0% reading + 4 digits)
TEMP °F	0 to 500°F	1°F	±(3% reading + 4 digits)
FREQUENCY	5-100kHz 1000Hz 10KHz 50KHz	0.01Hz 0.1Hz 1Hz 10Hz	±(1.0% reading + 4 digits)

NOTE: Accuracy consists of: (% reading i.e. accuracy of the measurement circuit + digits i.e. accuracy of the analog to digital converter)

OPERATING INSTRUCTIONS

1. DC VOLTAGE MEASUREMENT

⚠ **WARNING: MAXIMUM INPUT IS 600V DC.**

➔ Plug the red test lead into **V/F** jack and the black test lead into **COM** jack.

➔ Press the Power button.

➔ '400.0', **Ω** and **•))** and will appear on the display with the digit '4' flashing.

➔ Press V pushbutton once, 'AC' and 'V' will appear on the display.

➔ Press AC/DC pushbutton once, 'DC' and 'V' will now appear on the display.

➔ Apply the test leads to the circuit to be measured. Ensure that the black lead is connected to the negative side of the circuit and the red lead to the positive.

➔ Read the displayed voltage.

➔ If minus (-) sign appears the voltage is negative at the point being measured.

2. AC VOLTAGE MEASUREMENT

⚠ **WARNING: MAXIMUM INPUT IS 600VAC (RMS).**

➔ Plug the red test lead into **V/F** jack and the black test lead into **COM** jack.

➔ Press the Power button.

➔ '400.0', **Ω** and **•))** and will appear on the display with the digit '4' flashing.

➔ Press V pushbutton once, 'AC' and 'V' will appear on the display.

➔ Apply the test leads to the circuit to be measured.

➔ Read the displayed voltage.

3. DC CURRENT MEASUREMENT

⚠ WARNING: DO NOT BREAK OR OPEN THE DC LINE BEING MEASURED. WHEN MEASURING DC CURRENT THIS UNIT IS DESIGNED TO CLAMP AROUND ONE OF THE DC LINES. DO NOT ATTEMPT TO MEASURE CURRENT USING THE TEST LEADS. DO NOT PUT MORE THAN ONE WIRE INSIDE THE CLAMP JAW. DISCONNECT THE TEST LEADS BEFORE TAKING ANY MEASUREMENTS.

➔ Turn off power to the DC line being measured.

➔ Press the Power button on the clamp meter.

➔ Press [A] pushbutton once. 'AC' and 'A' will appear on the display.

➔ Press [AC/DC] pushbutton once, 'DC' and 'A' will now appear on the display.

➔ If the display indicates reading other than '0000', use a small screwdriver and adjust the Zero Adjust control until the display reads '0000'.

➔ Press the trigger to open the clamp jaws and close around one insulated conductor of the DC line being measured. Ensure that the jaws are completely closed and do not make any contact with the DC line. For maximum accuracy it is recommended that the conductor passes through the centre of the clamp head opening (use the centering marks on the jaws as a guide).

➔ Now apply power to the DC line being measured.

➔ Read the displayed current indicated with proper decimal point and symbols.

➔ Open clamp jaws and release.

4. AC CURRENT MEASUREMENT

⚠ WARNING: DO NOT BREAK OR OPEN THE AC LINE BEING MEASURED. WHEN MEASURING AC CURRENT THIS UNIT IS DESIGNED TO CLAMP AROUND ONE OF THE AC LINES. DO NOT ATTEMPT TO MEASURE CURRENT USING THE TEST LEADS. DO NOT PUT MORE THAN ONE WIRE INSIDE THE CLAMP JAW. DISCONNECT THE TEST LEADS BEFORE TAKING ANY MEASUREMENTS.

➔ Turn off power to the AC line being measured.

➔ Press the Power button on the clamp meter.

➔ Press [A] pushbutton once. 'AC' and 'A' will appear on the display.

➔ Press the trigger to open the clamp jaws and close around one insulated conductor of the AC line being measured. Ensure that the jaws are completely closed and do not make any contact with the AC line.

For maximum accuracy it is recommended that the conductor passes through the centre of the clamp head opening (use the centering marks on the jaws as a guide).

➔ Apply power to the AC line being measured.

➔ Read the displayed current indicated with proper decimal point and symbols.

➔ Open clamp jaws and release.

5. RESISTANCE MEASUREMENT

⚠ WARNING: REMOVE ALL POWER FROM CIRCUIT BEING TESTED WHEN CHECKING RESISTANCE. DISCHARGE ANY CHARGED CAPACITORS. NEVER CONNECT THE PROBES TO ANY VOLTAGE WHILE THE FUNCTION IS SET TO Ω/·))).

➔ Plug the red test lead into **Ω/·))** jack and the black test lead into **COM** jack.

➔ Press the Power button.

➔ '400.0', **Ω** and **·))** and will appear on the display with the digit '4' flashing.

➔ Press [Ω/·))] pushbutton once, MΩ will now appear on the display.

➔ Apply the test leads to the circuit to be measured.

➔ Read the displayed resistance with proper decimal point and symbols (**Ω** or K**Ω** or M**Ω**).

6. CONTINUITY TEST

⚠ WARNING: REMOVE ALL POWER FROM CIRCUIT BEING TESTED WHEN CHECKING CONTINUITY. DISCHARGE ANY CHARGED CAPACITORS. NEVER CONNECT THE PROBES TO ANY VOLTAGE WHILE THE FUNCTION IS SET TO Ω/·))).

➔ Plug the red test lead into **Ω/·))** jack and the black test lead into **COM** jack.

➔ Press the Power button.

➔ '400.0', **Ω** and **·))** and will appear on the display with the digit '4' flashing.

➔ Touch the test probe tips to the circuit or wire you wish to check.

➔ If the resistance is less than 36**Ω**, the audible signal will sound. The display will also show the actual resistance in ohms with proper decimal point.

NOTE: The display will read up to a maximum of 400 ohms in Continuity mode.

7. FREQUENCY MEASUREMENT

NOTE: The meter will read frequency of voltages from 10V to 600V.

➔ Plug the red test lead into **V/F** jack and the black test lead into **COM** jack.

➔ Press the Power button.

➔ '400.0', **Ω** and ·•)) and will appear on the display with the digit '4' flashing.

➔ Press Hz pushbutton once, 'Hz' will now appear on the display.

➔ Apply the test leads to the point of measurement.

➔ Read the displayed frequency with proper decimal point and symbols (Hz or KHz).

8. TEMPERATURE MEASUREMENT

⚠ WARNING: DO NOT MEASURE TEMPERATURE OF METAL PARTS WITH VOLTAGE PRESENT ON THEM. REMOVE ALL VOLTAGE SOURCES FROM THE CIRCUIT TO BE TESTED BEFORE TAKING A TEMPERATURE MEASUREMENT. DISCONNECT THE TEST LEADS BEFORE TAKING ANY MEASUREMENTS.

➔ Insert the temperature probe into TEMP socket, making sure to observe the correct polarity.

➔ Press the Power button.

➔ '400.0', **Ω** and ·•)) and will appear on the display with the digit '4' flashing.

➔ Press °F pushbutton once and '°F' will appear on the display.

➔ Touch the probe to the component you are testing and keep it there for about 30 seconds or until the reading stabilizes.

➔ The digital reading will indicate the proper value with decimal point.

9. MIN/MAX MEASUREMENT

NOTE: When MIN/MAX *button is pressed to go in to MIN or MAX mode, the autoranging feature is cancelled and the meter will stay in the range it was last in when the* MIN/MAX *button was pressed. If a measurement being taken exceeds this range, the meter will display the maximum range with the far left digit flashing.*

NOTE: The MIN/MAX mode will not work for temperature measurements.

➔ Depending on the type of measurement required, follow the instructions for inserting the test leads and function selection.

➔ Apply the test probes to the component or clamp jaws around the wire whose variable is to be measured.

a) For MIN value measurement:

➔ Press MIN/MAX pushbutton once, 'MIN' and 'D-H' will appear on the display. As the value changes, the meter will show the lowest value measured.

b) For MAX value measurement:

➔ Press MIN/MAX pushbutton twice, 'MAX' and 'D-H' will appear on the display. As the value changes, the meter will show the highest value measured.

NOTE: When using MIN/MAX measurement, if the test leads are moved to test another component, the value may or may not change depending upon the range the meter was last in. The meter must be turned OFF and the entire procedure must be re-applied.

CAUTION: To cancel MIN/MAX measurement, the meter must be turned OFF. Using MIN/MAX *pushbutton will only cancel this feature, but will not restore the meter's autoranging feature.*

10. DATA HOLD

This function is used to hold a reading. When this pushbutton is pressed, the data being displayed at the time will be frozen and 'D-H' will appear on the display. Changes in the input signals will not change the display. The value will show on the display until cancelled. This function can be used in all measurement modes. Press the pushbutton again to release this function and 'D-H' will disappear.

11. BATTERY REPLACEMENT

⚠ WARNING: DISCONNECT BOTH TEST LEADS FROM ANY SOURCE OF VOLTAGE BEFORE REMOVING THE BACK COVER. DO NOT OPERATE THE METER UNTIL THE BACK COVER IS IN PLACE AND FASTENED SECURELY.

BATT will appear in the display when the battery drops below the operating voltage and requires replacing.

➔ Turn off the meter and disconnect both test leads.

➔ Remove the single screw securing the battery cover and lift to open.

➔ Replace the **9V battery** observing the correct polarity.

➔ Replace the cover and tighten the screw.

MAINTENANCE

a) Always keep the meter dry.

b) Keep the meter clean. Wipe the case occasionally with a damp cloth. Do not use chemicals, cleaning solvents or detergents.

c) Use and store the meter in recommended normal environmental conditions. Extreme temperatures can shorten the life of the electronic components.

d) Use only fresh batteries.

e) Remove the battery when the meter is not being used for a long period of time.

ACCESSORIES

Test Leads (TL-108)
'K' Type thermocouple (TL-190)
Screw-on Alligator Clips (TL-210)
Battery: 1 x 9V
Carrying Case

LIMITED WARRANTY

Circuit-Test Electronics warrants to the original purchaser that this product be free of defect in material or workmanship for a period of 2 years from the date of purchase. Visit our website (www.circuittest.com) for information on warranty service.

Any product which has been subjected to misuse or accidental damage is excluded from the warranty. Except as stated above, Circuit-Test Electronics makes no promises or warranties either expressed or implied including warranties of merchantability or the fitness for any particular purpose.

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